

THE SIBLING SPECIES OF BUDWORM MOTHS IN CANADA

The entire April, 1953, issue of *The Canadian Entomologist* is devoted to papers on the Spruce and Jack Pine Budworms. These six contributions constitute together a superb exposition of the biological details of the differences and similarities of these extremely closely related species. In the first paper Dr. FREEMAN describes and names the Jack Pine species as *Choristoneura pinus* sp.n. and discusses the existence of several other possible "cryptic species" of *Choristoneura* feeding on conifers in Canada and the northern and western U. S. A. Eighteen specimens of *C. pinus* and its sibling, *C. fumiferana*, are beautifully figured in color. There are identification differences of ground-color, wing-pattern, size, and ♂ genitalia; for each there is probably some overlap. Miss COX analyzes genitalic and larval differences in terms of frequency distribution in the third article.

In the second paper Miss MACKAY shows, with fine figures, the larval differences between the two species. These seem to be more absolutely characteristic than the adult differences.

Mr. CAMPBELL shows color differences in the pupa (with color photographs) and in the egg-clusters. *C. pinus* lays an average of 37 eggs per cluster; the average for *C. fumiferana* is 19.

The most remarkable discoveries by this Canadian group are analyzed by Dr. SMITH. The distinctness of the two *Choristoneura* is maintained, in the many areas where the ranges meet, by inherited reproductive isolation. *C. fumiferana* larvae feed on Balsam Fir, Black and White Spruce, and Larch; *C. pinus* feeds almost solely on Jack Pine. The eclosion periods (28 June - 13 July and 11 July - 28 July) of the two species hardly overlap, and *C. fumiferana* copulates slightly earlier in the day, so that temporal isolation is nearly complete. Mate-choice tests in cages show that each species strongly prefers to mate with its own species. No notable sterility appeared in the hybrid eggs, but eggs laid by hybrid ♀♀ showed as much as 25% sterility, due presumably to chromosomal differences. Dr. SMITH makes an apparently unwarranted statement that hybrid inviability does not operate "in preventing the flow of genes between these two species of *Choristoneura*." Even with full fertility and fecundity, if the foodplant suitability is as exclusive as is stated, the hybrid larvae would be expected to have some combinations of nutrition genes giving reduced survival. One aspect of this cooperative study of *Choristoneura* siblings about which one would like particularly to know more is the matter of comparative nutritional physiology. Dr. SMITH's footnote 6 suggests that tolerance of either species and their hybrids to Jack Pine has not been tested in the laboratory. It seems possible that 1) F₂ and backcross sterility due to the chromosomal differences and 2) nutritional inviability of hybrids are the most important factors causing separation of these two *Choristoneura* populations as species and that these arose during former geographic isolation. It may be that mate-choice, oviposition-plant selection, and temporal isolation arose after the populations again became sympatric and were then strongly favored by natural selection. There seems to be no evidence against such a neo-Darwinian interpretation.

The final paper, by Dr. WALLEY, lists the 13 parasitic Hymenoptera known to have *C. pinus* as a host, 9 of which were also known from *C. fumiferana*.

These papers place the two *Choristoneura* in the literature beside *Mitoura besseli* and *gryneus*, *Colias australis* and *hyale*, *Strymon caryaevorus* and *falacer*, *Hyalophora angulifera* and *promethea*, and other foodplant-based complexes of sibling species of Lepidoptera which provide important information on the origin of species.

The papers on *Choristoneura* under review are as follows:

1. Freeman, T. N., "The Spruce Budworm, *Choristoneura fumiferana* (Clem.) and an allied new species on pine." *Can. Ent.* 85: 121-127, 22 figs.
2. MacKay, Margaret R., "The larvae of *Choristoneura fumiferana* (Clem.) and *C. pinus* Free." *Can. Ent.* 85: 128-133, 14 figs.
3. Campbell, I. M., "Morphological differences between the pupae and egg clusters of *Choristoneura fumiferana* (Clem.) and *C. pinus* Free." *Can. Ent.* 85: 134-135, 6 figs.
4. Cox, Constance E., "Analysis of frequency distribution of adults and larvae of *Choristoneura fumiferana* (Clem.) and *C. pinus* Free." *Can. Ent.* 85: 136-141, 4 figs.
5. Smith, Stanley G., "Reproductive isolation and the integrity of two sympatric species of *Choristoneura*." *Can. Ent.* 85: 141-151, 1 fig.
6. Walley, G. Stuart, "Hymenopterous parasites of *Choristoneura pinus* Free. in Canada." *Can. Ent.* 85: 152.

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